

RAILROAD—PORTAGE SUMMIT, OHIO, TO HUDSON RIVER.

LETTER

FROM

The Secretary of War, transmitting a survey of a route for a Railroad from the Portage Summit of the Ohio canal, to the Hudson river.

FEBRUARY 29, 1832.

Referred to the Committee on Internal Improvements.

DEPARTMENT OF WAR,

February 28th, 1832.

SIR: In compliance with a resolution of the House of Representatives, of the 23d instant, I have the honor to enclose a copy of the report "of a survey or examination of a route for a railroad from the portage summit of the Ohio canal to the Hudson river."

I have the honor to be,

Very respectfully,

Your obedient servant,

LEW. CASS.

Hon. ANDREW STEVENSON,

Speaker of the House of Representatives.

TOPOGRAPHICAL BUREAU,

February 28th, 1832.

SIR: I have the honor to lay before you the copy of a report on the reconnaissance of a railroad route from Hudson river to the portage summit of the Ohio canal, called for by a resolution of the House of Representatives, dated 23d instant.

With great respect,

I remain, sir,

Your obedient servant,

J. J. ABERT,

Topographical Engineer.

Hon. LEWIS CASS,

Secretary of War.

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WASHINGTON, 26th January, 1832.

To Lt. Colonel JOHN J. ABERT, *Topographical Bureau*:

SIR: I have the honor to submit the following report on a reconnoissance of a railroad route between the Hudson river, at Jersey city, and the portage summit of the Ohio canal, at Akron.

1. To explain, satisfactorily, to the individuals interested in the examinations of the different routes, why *all* were not examined, it is necessary to remind you, that the order which I received on that subject restricted me to my personal allowances, and deprived me of the assistance and co-operation of officers whose labors would have afforded me great facilities in an exploration so arduous and so complicated. This state of things must be my apology for the imperfections of the report; and my excuse to those persons to whom I applied for local information; which, I am happy to acknowledge, was, in most cases, furnished with great frankness and friendly sympathy.

2. The utility and practicability of accomplishing a *water* or *land* communication to unite the Hudson river and Lake Erie, by a route through the southern counties of New York, at different and remote periods, received the sanction of many highly patriotic and distinguished individuals, under the term of a National Appian way, a State road, and a central canal; and perhaps, at this time, it may be deemed fortunate, since the merits of railroad improvements are now better understood than formerly, and a more perfect and general knowledge of the resources of the lands, and the localities of the route attained, that the want of adhesion among their advocates, and strong counter interests, defeated the adoption of the original plans.

3. To enumerate all the benefits of railroad communications, would increase this report to an unreasonable length. Their merits will be found in the popular railroad treatises of the day. Their introduction as extensive lines of inter-communications, and their most striking advantages as useful improvements and public thoroughfares, consist in the facility of crossing a mountainous country, and of overcoming elevations, and the benefits they present of an uninterrupted avenue throughout the year, and the great speed, power, and economy, which can be obtained on them by substituting steam for horse labor.

4. Good roads have an influence over physical impossibilities, and by diminishing natural impediments, they bring places and their inhabitants nigher together. They increase the value of lands and the fruits of the earth in more remote situations, and, enlarging the sphere of supply, prevent those sudden fluctuations in prices, alike prejudicial to the grower and the consumer. They promote a free intercourse among the citizens of remote places, by which unfounded prejudices and animosities are dissipated, and a nationality of character, desirable to be encouraged, is universally inculcated.*

5. The considerations which would most forcibly present themselves for investigation in determining the properest route for the proposed work, would be to obtain the directest line; the levellest lands and most gradual slopes, to overcome the elevations, to secure the elements of revenue in the districts traversed by the road, and suitable materials for its construction; to unite with other improvements, so as to extend more fully to remote lands the benefit of the work as a public thoroughfare, and to consolidate conflicting interests; and to distribute, equally, to the communities interested, the advantages which would flow from its completion.

6. As a national improvement, the proposed work presents many inducements, as it would be a commercial, post, and military, route. It would diminish space, and unite, in strong mutual interests, different communities and States. It would increase the value and speedy sale of the public domain. It would condense the population on our northern frontier, and, by connection with other improvements, it would add to the general prosperity of the whole country.

7. It would benefit the States interested, as it would secure, at all seasons of the year, an uninterrupted and speedy communication between the east and the west. It would add to their wealth and importance, by promoting the settlement and cultivation of wild lands, and the erection of manufactories, and the working of mines. It would instil enterprise among their citizens, introduce capitalists, and benefit them by possessing an improvement equal, if not superior, to any other work.

8. To individuals it would lessen the rates and risks of transportation of all kinds of commodities, and facilitate the movements of the traveller. It would add to the uniformity of prices in our Atlantic markets, and would augment the value of the mine, of the soil, and of the forest, and all the varieties of manufactured articles.

9. It would be of signal importance to our citizens on our tide waters, as it would insure to them, in times of danger and scarcity, protection and supplies. But to the cities of New York, Philadelphia, and Baltimore, it would confer benefits only commensurate with the full development of the rich resources of our western lands.

10. The Hudson river presents, between the cities of Troy and New York, a tide channel, and the navigation for vessels is unobstructed as high up as the city of Hudson. Towns and villages are scattered along on the margins; and those on the western bank preferred claims, and held out inducements to be the point of termination of the State road, as formerly contemplated by the State of New York. The most prominent were the villages of Athens, Catskill, Kingston, Newburgh, and Nyack.

* Report Committee House of Representatives, March 3d, 1816.

11. The object of my examinations was not to select a route from the many proposed, or decide on their merits; but to explore the one which presented, at the first view, the easiest practical line; the time which I could also devote to the examination was not more than sufficient to pass over one route. I was, therefore, guided by the reflection, that, to confer the full benefit of my labors, it was important to select, as a starting point, the one nearest the city of New York. My explorations, therefore, began at the city of Jersey, as embracing the first, and many other important considerations.

12. In commencing my explorations at the city of Jersey, as the extreme southern point of the route, it must be understood that I do not recommend it as the most eligible situation for the termination of the proposed road. For its local merit, and the convenience of its proximity to the city of New York, must be carefully compared with other points which may be equally as proper for ending the work on the Hudson river; and only on a fair hearing of the claims of all the places interested, and on extensive instrumental surveys of all the routes, and on a full analysis based on all the facts involved, can this point be established.

13. The landing of Tappan, twenty miles above the city of Jersey, on the Hudson river, has been represented as embracing great merit as a place to end the road. The landing is near the mouth of Tappan creek, in the State of New York, and the river is seldom obstructed by ice between it and the ocean. There is also depth of water, and a width of channel, sufficient for shipping of all classes to approach it.

14. There are, however, objections to ending the work at this point. They consist in the distance from the city of New York, and the shoal water which lies between the shore and the channel. This last objection could be surmounted by constructing docks and piers, or by ending the line at Dobb's ferry.

15. It is contemplated to construct a railroad between Albany and New York, on the east side of the Hudson river. If a ferry should therefore be established at Tappan landing, the cars, with their freight, might be taken over, and transported directly on that work into the city. This arrangement might be attended with some risk and inconvenience, and would probably be more expensive than to send, by vessels, the freight to the city of New York.

16. To explain the character of the routes will require much detail. I shall therefore assume, as a fixed point, the valley of the Ramapo river, at Pierson's works. Commencing our examinations at Jersey city, the route would pass over the Bergen ridge, and intersect the Paterson railroad, and continue in conjunction with that work to the mouth of Saddle river; it would then ascend that stream, and its west branch, and pass in the vicinity of the New Prospect and Goshen turnpike, to the valley of the Ramapo: the distance would be about 35 miles.

17. The whole route of the Paterson railroad, if considered necessary, could be adopted, and the valley of the Passaic and Ramapo rivers could be followed to Pierson's works, which would increase the distance about twelve miles.

18. The Bergen ridge separates the waters of the Hudson and Hackensack rivers. It commences near the bay of Newark, and ends near Dobb's ferry. It is from one to six miles in width at its base, and with occasional ravines in its sides; at the extreme northern end, it is over 400 feet above

tide water; and at the Bergen church, where the line would probably cross, it is not more than eighty or eighty-five feet. It would be questionable if inclined planes, a tunnel, or a uniform grade of the road, would be best to cross this obstacle.

19. The Paterson and Hudson Railroad Company are incorporated by a grant of the State of New Jersey; they have commenced their work, and part of it is nearly completed. If the great western railroad should adopt it as a part of its route, it would add much to its value and general usefulness.

20. The Hackensack and Passaic rivers are separated by extensive salt meadows; to construct the work over them, will involve much difficulty and expense.

21. The second route ascends the valleys of the Hackensack and the English creek, to the head of tide. It then crosses over those streams, and ascends the Pascack creek, and passes obliquely over the high grounds which intervene between it and the valley of the Ramapo. The length of the route would be about 37 miles.

22. The Ramapo river, by Mr. Moffat's survey, at Pierson's works, is 232 feet above tide. A line at this elevation, or deviating a little from it, could probably be taken over the ridge which separates the Passaic and Hackensack valleys.

23. There have never been instrumental surveys of any of the routes described, except that part in conjunction with the Paterson railroad. The country is, however, highly agricultural, and no formidable impediments are presented to the eye in passing over it.

24. The line which commences at Tappan landing would ascend the Tappan or Spar creek; and, after passing over the ridges of land which separate the waters of the Hudson, Hackensack and Passaic rivers, ends at Pierson's works: the length of the route would probably be 23 miles.

25. The Ramapo valley is remarkable for the wildness and singularity of its scenery. It breaks through the chain of mountains which cross the Hudson river at West Point. Its general course is through a contracted and gloomy defile, and it flows with a sluggish current. By diverging upon one of its branches, the route attains the height of land in Orange county, which separate the tributaries of the Ramapo from those which flow into Murderer's creek and the Walkill river.

26. From this summit extends a fertile and beautiful country, bounded by the highlands, through which we have passed by the Ramapo valley and the Shawangunk mountains on the northwest. The height of land is 549 feet above tide, or 317 feet above the Ramapo at Pierson's works: the distance to it is eighteen miles, and the average rise is 12 feet in the mile. On an examination, it may be found necessary to resort to stationary power on the summit, and the shape of the ground presents a proper location for the plane.

27. From the height of land to the Walkill valley is about 13 miles; the average fall per mile is about 22 feet, and the probable elevation, at the point proposed to cross the Walkill river is 260 feet; at its sources, it is 430 feet, and, at the boundary line between New Jersey and New York, it is 325 feet above tide water. From the point of crossing, the line ascends to the base of the Shawangunk mountain, which is 228 feet above the Walkill valley. The Deer Park gap, one of the most eligible depressions to cross the mountain, is 792 feet above tide; "and Richardson's ravine is 50 feet low-

er:" the ascent from the base to the summit of the mountain is therefore 254 feet, or 482 feet above the Walkill river, and the distance is 12 miles, which gives an average slope of 40 feet per mile; stationary power would therefore be required at the summit.

28. The northern parts of the State of New Jersey are very much broken by mountains and ridges, which principally lie near the heads of streams which flow into the Delaware and Passaic rivers. It is therefore supposed that no route can be found farther south so favorable as the one by the Ramapo valley.

29. It has been suggested, to avoid crossing the Shawangunk mountain, that a practicable route would be found from the height of land in Orange county to the Delaware river, at the Water gap. On examination, it may prove correct, as the Walkill and its tributaries have their sources on high table lands; but it would render the route more circuitous, and increase considerably the distance.

30. Near the Walkill river, the route intersects the proposed line of the Orange and Sussex canal; at the base of the Shawangunk mountain, it would unite with the proposed Delaware and Newburgh railroad, and in the valley of Batherskill, with the Hudson and Delaware canal.

31. I have considered the line as ascending from the Walkill valley. This appears to be the fact from the levels of Mr. Moffatt in my possession; but on a more full examination, there may be found a small variation in the elevation of the ridge which separates the first stream from the Shawangunk river, and may increase the altitude of the plane on the south side of the mountain.

32. The descent from Richardson's ravine to the Hudson and Delaware canal is 210 feet. If we deduct from this 20 feet, to pass the road over the canal, it would leave a plane of 190 feet; which would be in favor of the direction of the trade, as it would not be so long or so elevated as the one on the south side of the mountain.

33. It will require, to cross the valley at Batherskill, a long and elevated viaduct or heavy mound, as the Hudson and Delaware canal is considerably elevated above that stream at Cuddebackville, the point at which it is proposed to cross it with the road.

34. Two routes present themselves from the valley at Batherskill to reach the Delaware river. The first route would follow the course of the Batherskill and the Neversink river to Carpenter's point, which is 451 feet above tide, or 81 feet below the summit level of the Hudson and Delaware canal, and 291 feet below the summit of the Shawangunk mountain at Richardson's ravine: the distance is about 10 miles, which gives an average slope of 29 feet in the mile.

35. The second is to follow Batherskill to its confluence with the Neversink river, and ascends the Bushkill to Clowes, a distance of eight miles, and is 1110 feet above tide, and 578 feet above the summit level of the Hudson and Delaware canal. Stationary power, therefore, would be required, and the waters of the Bushkill could be used for that purpose. From Clowes the ground ascends for ten and a half miles, which brings the line near the village of Monticello, and is 141 feet above tide. From this point the ground gradually descends for seven and a half miles to the valley of the Mongaup river, and is 1163 feet above tide at the place proposed to cross it. The ridge which separates the valleys of the Mongaup and Calli-

on rivers, is 1250 feet above tide, and the descent from it to the latter stream is 263 feet. The high land which lies between the main and north branch of the Callicoon is 1389 feet above tide, and the valley of the latter is 396 feet below the summit of the ridge: the greatest elevation on the route is between the west branch of Callicoon and Brower's creek, and is 1678 feet above tide. The Delaware river, at the mouth of the latter stream, is 36 feet above the same plane, and the rise to the village of Deposit is 104 feet.

36. I am indebted to Mr. Jones, of Monticello, for the elevations and distances on the last route. In a communication on that subject, he remarks: "I have not time to collect the distances, and to make correct calculations; but, from the view I have taken, I feel satisfied that lifts, by team power, will only be wanted at the Deer-Park gap summit, (1,678,) and the summit between the Delaware and the Susquehanna: that water power can conveniently be had to overcome the other elevations."

37. "By a more circuitous course, we can avoid the highest elevation east of the Delaware, by following the Callicoon creek to its junction with the Delaware river: but, I trust, we shall be able to find a more favorable route than the State road survey, without deviating essentially from a straight line."

38. It is, however, proper to observe, in relation to this last route, that the elevations furnished by Mr. Jones are the results of Moffat's survey for the State road: that he made his examinations with a common surveyor's instrument, and at a very inclement period of the year; and that the whole route between the village of Monticello and the mouth of Browers creek, is covered with a very dense forest, which makes it more than probable that the best route was not discovered.

39. Between the Hudson and Delaware rivers, we have traced three lines: the most southerly one to the water gap of the Delaware; the middle one to Carpenter's point; and the northerly one to the mouth of Brower's creek.

40. The Delaware river is navigable during certain periods of the year; and, at such times, large quantities of lumber are carried down, by its currents, to the Delaware bay. This singular stream has its sources on the highest lands between the Hudson river and Lake Erie. It generally flows through a contracted valley, and is bounded by elevated lands; and its numerous branches contain much rich soil. In its brief course, it breaks through three distinct ranges of mountains: at the Walpack bend; at the Water Gap, which is 2,500 yards in length; and at the Wygaat mountain, near Easton.

41. From Carpenter's point, the middle route ascends the Delaware river eighty-eight miles, to the village of Deposit. The stream, at this point, is 990 feet above tide, and the rise is 532 feet, which gives nearly an average slope of six feet per mile.

42. The practicability of the route from Carpenter's point to Deposit, is demonstrated by the construction of the Hudson and Delaware canal to the mouth of the Lakawaxen creek; and, above that point, by a survey for a canal made by Benjamin Wright, civil engineer, a few years ago, who not only pronounced it practicable, but easy of accomplishment. He also surveyed, for the same purpose, a line between the village of Deposit and Bettsburg, on the north branch of the Susquehannah, and arrived at a similar conclusion with the former.

43. The Delaware river, according to Mr. Mill's report, who acted as Judge Wright's assistant, preserves, between the mouth of the Lackawaxen creek and the village of Deposit, great sameness of character. The valley is not over half a mile in width, and numerous bluffs and mountains approach to the margin of the stream. The rocks are *grey wacke, sand, and rubble stone*. "No lime rock has ever been found in this district of country."

44. Between the Delaware and Susquehanna rivers, two routes are conspicuous. The extreme northern is between Bettsburg and Deposit. It has also been urged to follow the line of the Hudson and Delaware canal and railroad, between the mouth of the Lackawaxen creek and the village of Carbondale, and to continue the line from the last point to the Susquehanna river, by descending the valley of the Lackawannock creek, and ascending the Susquehanna to Tioga point, or to continue the line over the ridge which divides the waters, of the Lackawannock and Sturua creek. A more southern route has been suggested, by the way of Milford, and the valleys of Renneys and Wallpenpack, through Cobb's gap, and down the Roaring brook to Carbondale, and to adopt either of the routes, from the last mentioned point, to reach the Susquehanna river.

45. The dividing ridge between Deposit and Bettsburg, according to the surveys of Mr. Wright, is 1,487 feet above tide. Mr. Henry makes the same point 1,689 feet. If the former be correct, the elevation of the ridge above the village of Deposit, is 497 feet. The distance is eleven miles, which gives the average rise 45 feet in a mile, and the descent to the Susquehanna river, 527 feet. The distance is 5 miles, or nearly an average fall of 105 feet per mile. This slope is the most formidable feature on the whole route; and, to overcome it successfully, and to accommodate the wants of the trade, will require powerful stationary engines on the summit.

46. The route between Stockport and Lanesborough has never been surveyed. It is, however, said by those who are familiar with the country, that its summit is not so elevated as that of the Hudson and Delaware railroad, on the Moosic mountain, and also lower than the ridge between Deposit and Bettsburg: it is 48 miles shorter than the latter route.

47. The objections urged against continuing the route from the village of Carbondale down the Lackawannock creek to the Susquehanna river, and up the latter stream to the Tioga point, is the rapidity of the fall of the creek, increasing the length of the route and the expense of the works. They are not, however, of such a character as to prevent a full examination of the line.

48. The Lackawaxen creek, at its mouth, is 603 feet; the head of the canal at Hornelsdale, is 914 feet; and the summit of the railroad, is 1,769 feet; and the village of Carbondale is 912 feet above tide water.

49. A route has been surveyed between the village of Carbondale and the mouth of the Sturua creek, by James Seymour. The summit of the ridge is 936 feet above Carbondale, and 1,848 feet above tide. The descent to the Susquehanna river is 1,158 feet. The length of the line is 47 miles.

50. In reviewing the routes between the Delaware and the Susquehanna rivers, we will discover that, unless a direct line crosses the dividing ridge which separates those streams, is adopted, and if the works are not confined to their valleys, *stationary* power will become frequently necessary. If we examine either of the southern routes, it will be seen that there are two summits requiring stationary engines; and, to avoid the great bend

the Susquehanna river, if we follow the most direct line, there will be a summit 1,557 above tide, to overcome. These routes would occasion waste of time, in the transit of trade, and would add considerably to the expense of the works; and could not be justified, unless supported by great advantages of public utility and accommodation.

51. The country between the Susquehanna and the Hudson rivers, presents to the eye a succession of knobs, clusters, and chains of mountains, irrigated by ridges and hills, and interspersed by deep and fertile valleys and uplands. The soil is principally gravel and loam, and the lands abound with stone, and other materials suitable for the construction of the works.

52. By following the line avoiding the great bend of the Susquehanna, and passing over the summit 1,557 feet above tide, the length of the route could be considerably diminished. Mr. Henry stated the length of the line between Deposit and Russell's tavern to be $27\frac{1}{4}$ miles. This route could confine the work entirely in the State of New York.

53. The north branch of the Susquehanna river is proposed to be improved by locks and dams to the Otsego lake. The length of the improvement would be 82 miles, and the fall is 292 feet. If a railroad should be substituted, the average grade of the work would not exceed $3\frac{1}{2}$ feet per mile.

54. Near the mouth of the Sturuga creek the route unites with the one contemplated from the village of Carbondale to the Susquehanna river, and it is probable that this junction would be more beneficial to the interest of the latter improvement, than an extension of the Ithica and Owego railroad to the same point, as it would open a greater extent of country to be supplied from that valuable coal district, than any other route proposed.

55. At Binghampton the line intersects the proposed route of the Chenango canal, which commences at Whitesboro'. The distance from that place to the north end of the summit level of the canal, is 19 miles; the rise is 706 feet, the length of the summit level is $17\frac{1}{2}$ miles; and the distance, from the southern end of that level to Binghampton, is 59 miles, and the fall is 303 feet. This canal or a railroad on the same route, would concentrate, at Binghampton, the trade of that rich and improving valley.

56. At the village of Owego, the route unites with a railroad between that point and the Cayuga lake. The length of the road is 30 miles, and the rise, from the Susquehanna to the summit, is 179 feet; the fall to the Cayuga lake 593 feet. At Tioga point, the route connects with the contemplated Pennsylvania canal, and will open a communication by that work and the Susquehanna railroad with the cities of Philadelphia and Baltimore.

57. The Susquehanna river at Bettsburgh is 960 feet, at the mouth of Chenango river 828 feet, at Tioga point it is 775 feet, above tide. The distance between the extreme points is 86 miles, the fall 185 feet, which gives an average grade of $2\frac{1}{4}$ feet per mile.

58. Near Tioga point, the line diverges and ascends the Chemung river; at Elmira, it connects with the Chemung and Seneca lake canal. The length of the improvement is 18 miles, and its summit is supplied by a feeder $13\frac{1}{2}$ miles long, from the Chemung river at the Chimney narrows. The descent from the summit level to Elmira is 53 feet, and the fall to the Seneca lake is 443 feet. The route also intersects at Elmira the proposed railroad between the Chemung river and Williamsport, on the west branch of the Susquehanna.

59. The Chemung river is formed by four branches. Those, in the direction of the route, are the Canisteo, the Conhocton, and the Connewisque. They all drain rich districts, capable of yielding most of the luxuries and necessities of life. The Canisteo and the Conhocton head on the ridge which separate the waters which flow into lake Ontario and the Susquehanna valley. The Connewisque rises in the State of Pennsylvania and some of its numerous branches approximate near the streams which discharge into the Genesee and Alleghany rivers.

60. The Conhocton, at Bath, is 1120 feet; the ridge which lies between it and the Canisteo valley is 1840; and Arkport, on the last stream, is 1,194 feet; and the height of land between Arkport and the Angelica creek is 2,062 feet; and the village of Angelica, 1428 feet, above tide. The length of the route between Bath and Angelica is $45\frac{1}{2}$ miles, and the total rise and fall of the route is 2,868 feet, which gives an average grade of 62 feet per mile. By adopting this route, it would require stationary engines on the summits between the Conhocton and the Canisteo, and between the last stream and Angelica creek; and increases considerably the length of the road.

61. The summit level of the Chemung canal is 920 feet, and the dam at the Chimney narrows will create slack water to the mouth of the Canisteo. The village of Hornelsville, on that stream, is estimated to be elevated 160 feet above its mouth; and the distance to Tioga point, by following the valleys of those streams, is 74 miles. The rise is, therefore, 305 feet, and the grade of the road between those points would not exceed 4 feet per mile.

62. The height of land which lies between the sources of the Conedee and Angelica creeks, is estimated at 1750 feet above tide; and if the elevation is correctly stated, there is a rise of 670 feet from Hornelsville to the summit, and the fall to the village of Angelica is 322 feet.

63. The Genesee river, at Belvidere, is 1,200 feet, the dividing ridge between the Genesee and Alleghany river is 1,488 feet, and the last stream at Olean point is 1,410 feet, above tide; and the aggregate rise and fall is 406 feet. If to this be added the elevation and depression of the route between the first point and Hornelsville, it gives 1,398 feet. The distance is 77 miles, and the average grade would be about 17 feet per mile. But the length of the route between Hornelsville and the Genesee river is 24 miles, and the total rise and fall on that part is 1,121 feet; stationary power would, therefore, be required between those points. The aggregate rise and fall between the Genesee and Alleghany river at Olean point, is 277 feet, and the distance is 33 miles; which will not be quite 7 feet rise and fall in the mile.

64. Mr. Cameron, of Bath, (deceased,) with several other gentlemen of science and reflection, had, at one time, seriously in contemplation, to open a canal communication by the Canisteo route, to unite the Genesee and Susquehanna valleys.

65. At the mouth of the Conhocton, the line could be united to a railroad from the village of Bath, and with the Crooked lake railroad, and the Crooked lake and Seneca canal, and at Painted post, with a lateral branch from the coal mines at Canal port. In the valley of the Genesee river it would unite with the proposed canal (or railroad) between Rochester and Olean point. The length of that route is 103 miles; and the summit level is 981 feet above the Erie canal, and 78 feet above the Alleghany river.

66. The country at the head of Oil and Black creeks is a very extensive swamp, and, during floods, the waters in Oil creek at the mills of Cady and

Baldwin, pass over a low marsh into Black creek. Those streams rise within 80 rods of each other. The Ichua creek is more elevated than the summit on which Black and Oil creeks originate.

60. The Connewisue presents a more direct course to reach the Alleghany river, than either the Conhocton or the Canisteo. The only fact I have, in relation to the practicability of this route, is, that a few years ago a number of persons were employed to examine the country between the little Genesee, a branch of the Alleghany, and the main Genesec valley. They stated that the country is very level, and with a rich soil.

68. The route has now crossed the great ridges, chains of mountains, and streams which intervene between the Alleghany and the Hudson rivers, and entered on the tributary waters of the Mississippi. It has also reached Olean, famous as a point for the embarkation of emigrants to the western States. The river at this place is two chains and fifty links wide; and, at the Pennsylvania and New York line, it is 17 feet higher than at Olean point; and as low down as Warren, the stream has an average width of sixteen rods. In this distance, there are thirty bars which obstruct the navigation at low water. The banks present the same features as are generally found on the western streams.

69. The distance from Warren to Franklin is sixty miles; and the western shore between those points, is very favorable for any improvement, with an exception of $3\frac{1}{8}$ miles; and materials for the works are found in great abundance, and good quality, and conveniently to be procured.

70. Olean Point is 1,410 feet; Warren, 1,162 feet; Franklin, 990 feet; Pittsburg, 756 feet; and the mouth of the Big Beaver, 698 feet, above tide water; and the fall, in the whole distance, is 712 feet.

71. The Alleghany river, with many of its branches, rise on a very extensive table land, on which also originate many of the streams which flow into lakes Ontario and Erie; and, as far as the mouth of Big Beaver, the whole beds of the Alleghany and Ohio rivers are much elevated above the surface of Lake Erie. The branches of those streams also extend far into the country, while those which discharge into that lake, have a very rapid and brief course. The country, therefore, on the Alleghany slope, is indented by streams with moderately elevated banks, while, on the lake side, the surface of the country is more abrupt in its descent, and the streams have scooped out deep and gloomy defiles.

72. From Olean point the line descends the Alleghany river to Warren. It would then follow the Connewango creek, and the outlet of Chautauque lake to Jamestown, or would continue down the Alleghany river to the mouth of the Broken Straw creek; which stream it would ascend to its sources, and intersect the head waters of French creek, or still descend the Alleghany river to Franklin, it would pass up the French creek, and the outlet of the Conneaut lake. These routes are all considered practicable, as they have been surveyed for canal improvements, and pronounced feasible.

73. The routes mentioned are very circuitous: to avoid them, two others have been suggested. The first, which I shall consider, has been surveyed by Mr. Silas Tiffany, who says, "I have examined the pass from the Alleghany river, by way of the Coveys' gap to the Connewango creek, and find the elevation about 130 feet above the stream." The place at which the proposed route would leave the valley of the Alleghany river, is 42 miles from Olean point, and 7 from the New York and Pennsylvania boundary line.

Vanhorn's creek, which the route would follow to Coveys' gap, is about 5 miles in length, and the width of its valley is from 80 to 100 rods. Its sources nearly interlock with Carr's run, apparently on the same level, and the distance between them is but a few rods. The valley of Carr's run, for the first half mile from its sources, is narrow, but of sufficient width for the road; and the balance of the valley (5 miles) is from 70 to 90 rods wide, bounded with hills sloping gradually to the bottom lands. The distance to Jamestown, from the intersection of Carr's run with the Connewango creek, is $6\frac{1}{2}$ miles. The length of the route is 59 miles. It appears by Mr. Silas Tiffany's examination, that the mouth of Vanhorn's run is 1,239 feet; the summit 1,369 feet; and the Connewango creek, at its junction with Carr's run, is 1,222 feet above tide water. This gives a total aggregate rise and fall of 520 feet.

74. The second route is to follow Cold Spring creek, and the Little Connewango creek, to the outlet of the Chautauque lake to Jamestown. A writer in favor of the central canal, in alluding to this route, says: "From the junction of the Little Connewango, the canal would follow the latter about 5 miles to its sources. This stream rises on the summit between the Connewango and the Alleghany river. Its course for a short length is pretty rapid, but the distance is so short, as to require but little lockage: on this summit rises also the waters of Cold Spring brook, and other streams running east into the Alleghany river." The length is short, and the descent is not great. Mr. Marvin, of Jamestown, estimated that the summit of this route "is lower than the one by Coveys' gap." The length of the route from Olean to Jamestown, is 57 miles.

75. The Chautauque lake is 1,294 feet above tide, and contains 16,000 acres. It is 18 miles long, and is from 30 to 100 feet in depth. From Mayville, at its northern extremity, it is proposed to construct a railroad to unite it with Lake Erie. The length would be $10\frac{1}{2}$ miles, and the fall 724 feet. From the lake to Warren, the distance is 24 miles, and the fall 132 feet. These lines have been pronounced to be very favorable for a canal.

76. From Jamestown, the line follows the western shore of the Chautauque lake to Goose creek, which stream it ascends to the height of land on which its waters, and those of the Broken Straw and French creek, nearly commingle. The elevation of the sources of Goose creek has never been ascertained by instruments. It has, however, been estimated by Mr. Tiffany, at 140 feet above the plane of the Chautauque lake. This may however be too little, as the high lands on the southern shore of lake Erie are from 1,000 to 1,300 feet above its surface; and most of the streams which originate on it, are from 600 to 1,000 feet above the lake. If the latter be correct, it would give a rise of 276 feet above the Chautauque lake, and the distance being 16 miles from Jamestown, the average ascent would be about 17 feet per mile.

77. The route from the sources of Goose creek, follows the valley of French creek to Waterford, in Pennsylvania: passes through Meadville, and over the outlet of the Conneaut lake, and enters the town of Kinsman, in Ohio, and through the villages of Warren and Ravenna, and ends at Akron, on the portage summit of the Ohio canal.

78. In the last distance, the route unites with the proposed canal to the harbor of Erie, and the one projected from the portage summit of the Ohio canal to Pittsburgh, and by their means with the whole of the State improvements of Pennsylvania, and the city of Washington, by the route of

the Potomac and Ohio canal, and by the Ohio canal with the whole extensive valley of the Mississippi and its tributaries.

79. The States of Ohio and Pennsylvania, and the United States, have made very extensive surveys for canal improvements in the last section of the route described, which completely demonstrates the practicability of the road from the sources of the French creek to Akron.

80. The La Boeuf lake is 1,218 feet; the Conneaut lake is 1,085; the source of the Mahoning and Grand rivers, is 912 feet. The Big Beaver river, at Warren, is 854 feet; and Champion's swamp, in its vicinity, is 1,012 feet. The summit near Ravenna is 1,073 feet, and the Portage level is 974 feet, above tide. The fall, therefore, from the sources of Goose creek to La Boeuf lake, is 352 feet; the difference in level of the La Boeuf and Conneaut lakes, is 133 feet; and between Conneaut lake and Champion's swamp, only 6 feet. The Ravenna summit is 67 feet above Champion's swamp, and 99 feet above Akron. The distance from the sources of Goose creek to La Boeuf lake, is 29 miles; and from the last point to Warren 65 miles, and to Akron 38 miles. The average slope of the road will not, therefore, in the first reach, exceed 13 feet per mile; and the remainder of the route might be graded less than three feet per mile.

81. The whole length of the road, if properly located, will not be more than 546 miles. Stationary engines will not be required at more than four places on the route, viz. at the Ramapo, Deer Park gap, between the Delaware and Susquehanna rivers, and between the Canisteo and Angelica creeks. The total elevations and depressions off the route, will not exceed 6,507 feet. The streams crossed by the route, present no great width or difficulties. It will, moreover, unite with ten extensive railroad and canal improvements completed, and ten others projected, and with nine rivers navigable at certain periods of the year.

82. The elevations and distances as given, are believed to be correct, as they have been carefully collected from the official reports of civil engineers and surveyors, and from other public documents relating to State improvements.

83. If a railroad should be made from Elmira, on the Chemung river, to Williamsport, on the west branch of the Susquehanna, and continued so as to join the railroad leading to Philadelphia and Baltimore, it would open a more direct communication with those cities, than any other route suggested or completed, and would be one of the links in a great line of railroad communication extending from New Orleans to Buffalo. The distances to Philadelphia and Baltimore, would not exceed 270 miles, while the present route to the first point is 374 miles, and the latter 394 miles, and are embarrassed with a dangerous and uncertain navigation.

84. In the course of a few years, it is not unreasonable to expect a railroad communication between the cities of New York, Philadelphia, Baltimore, and Washington; and, in conjunction with the works we have been considering, numerous mail avenues will be opened throughout the country. If the United States should not, therefore, be able to secure an interest in those works, or be able to control them, the transportation of the mail will be monopolized by private companies who will secure their own terms, or the community will be placed under great inconvenience by the Government permitting the mail to be carried in less time and certainty than it can be on those roads.

85. The resources of the country, in the sphere of the route of the proposed road, is very great. Judge Wright, in a report, in alluding to the canal line in the valley of the Delaware river, says: "my opinion is, if a canal was carried no further than Deposit, it would be, in a very short time after being completed, a very profitable work." From a personal examination, a few years ago, of the valley of the north branch of the Susquehanna, I am fully sensible of its fertility and its capability of sustaining almost any reasonable improvement. Judge Bates in alluding to the Chenango valley, and its resources to sustain a canal which would cost one million of dollars, says: "In less than five years after its completion, it will yield a surplus revenue beyond the interest on the capital, and the repairs of the work." Judge Geddes, in his report on the Chemung canal, alludes, in high terms, to the resources of that part of the States of Pennsylvania and New York; and William H. Bull, in his report on the Crooked lake and Bath canal, says: "It will accommodate a country 70 miles in length, extending from the east line of Alleghany county to Geneva, and also the country bordering on the Crooked lake, containing 'a population of more than fifty thousand inhabitants.'" Judge Roberts, in speaking of the Genesee and Alleghany canals, says: "it would accommodate a large section of our country, whose surperfluous productions are equal in quantity and qualities to those of any portion of the State." Doctor Whippo, and other engineers, speak in high terms of the Alleghany valley, and the country between it and Lake Erie. The best opinion of the fertility of the western States, may be formed from the numerous improvements projected or commenced to convey its surplus productions to the Atlantic cities. But if lateral improvements will produce such great results as are anticipated, how much more profitable will be one which passes from the east to the west, and communicates with them all?

86. The country in the vicinity of the route, abounds in minerals of the most useful and valuable kinds. "The anthracite coal is found on a line extending from the head waters of the Lehigh and Schuylkill to the Susquehanna at Wyoming, and from thence nearly to the Blue ridge." Mr. Meridith calculates that, if the consumption of coal was one million of tons annually, it would require 647 years to exhaust it.

87. Anthracite coal can be used in the manufactories of salt, in distilleries, in furnaces, in cotton, and woollen manufactories, and by the blacksmiths. It is also valuable as fuel, and for culinary purposes.

88. At Belmont mines Mr. Meridith states, that iron stones are found in circular masses, and weigh from 10 to 50 pounds, and will yield from 30 to 50 per cent. of metallic iron.

89. And in a very interesting paper, he says: "The transition region appears to extend from Berwick, 24 miles below Wilkesbarre, in a northerly direction, to the Otsego lake. Its length is nearly 160 miles, and its breadth from Nanakeating hollow, westward to the ridges of the Alleghany, will exceed 110 miles. In all this extensive region, there is no limestone, no gypsum, no salines, in any quantity."

90. "A great part of the country, where the lime, the salt, and the gypsum will be used, is susceptible of a dense population, although it is at present thinly inhabited and badly cultivated; that a large part of its surface is covered with forest; that its streams are only navigable at one or two seasons of the year, and that it is destitute of all active trade and coal markets."

91. At Tonewanda, on the Susquehanna; and at Canal port, on the Chemung river, and at Olean point, on the Alleghany; and in the county of Portage, in Ohio, bituminous coal, in large and rich mines, are found, and worked.

92. Iron ore, in extensive beds and masses, have been discovered at various places, and they have been pronounced by those who have examined them, to be equal in quality to any discovered in this country or Europe;* and bismuth and copper, and galena, have been found, and gold and silver ores in small quantities, on Pine creek near Canal port.†

93. On the north side of the mountain, near Canal port, sulphate of iron occurs in the strata of coal. In the valley of the Genesee, silicious rock is found suitable for making glass of the finest quality; and quarries of stone of the most durable and useful kinds, are dispersed over this interesting region. The forests are stored with trees of every description, suitable for ship building, for carpenters', and for ordinary and ornamental, works. The soil is also rich for cultivation and for pasturage, and the climate is salubrious; and the country is capable of sustaining a dense and busy population, which must be the case whenever a secure and cheap avenue is opened from it to our tide waters.

94. This interesting region is, however, suffering great inconvenience from its sequestered condition: in an able address to the Legislature of the State of New York, some of them are exposed; and, as they have a strong bearing on the merits of the improvement and condition of the citizens in the northern counties of Pennsylvania, and the southern ones of New York, I shall quote from it.

95. "Those who reside in the vicinity of the canal, or who have direct communication with it, are now in full enjoyment of a permanent, safe, cheap, and easy route, for the conveyance of their produce to market at a cheaper rate than in former years: when the markets are favorable, they return home enriched; when they are unfavorable, they return without loss."

96. "But the situation of those who cannot use the navigable waters, are far different: it is in winter only, through storms and bad roads, they can venture with their produce to market. If the snows fail, which they often do in our variable climate, the surplus of their husbandry is lost, the toil and labor of the past year are gone for nothing. If transportation in wagons is attempted, it costs not only the expected profit, but the capital itself."

97. "By means of the Erie canal, Rochester, at the distance of 400 miles from the city of New York, has been brought nearer market than Delaware at 180 or 200, and its products are enabled, in consequence, to compete with the settlements of the south, and by the diminished expense of transportation, to drive their products almost wholly from that market."

98. It has been said by some few persons that the proposed improvement would injure the business of the Erie canal. Those who advance this opinion can have reflected but little on its solidity, as it could not injure, but must manifestly benefit, that work. For the gypsum, salt and lime of the western counties of New York, would be exchanged for the minerals found on the Susquehanna and its tributaries. It has also been urged by many writers, that the Erie canal will, in the course of a few

* Examined by George W. Hughes, Esq. U. S. Assistant Civil Engineer.

† See Mr. Hughes' interesting geological report.

years, be unable to pass the immense trade, which will be concentrated on it; and that a second improvement will be required by the public interest.

99. I cannot, however, but remark, that in the course of a few years the canal debt of the State of New York will be paid. It is then reasonable to be supposed that the tolls will be reduced on all freights. In that event, transportation will most probably be done cheaper on that work than on any new improvement in its vicinity, which will require a heavy expenditure of capital, and entering directly into competition with the canal. It is true, that a railroad would possess greater speed and certainty than the old work. But the former will be embarrassed by the outlay of six or seven millions of dollars, and will accommodate the same population and lands as the canal. Is it, therefore, unreasonable to apprehend that the new improvement will be unproductive to its proprietors, and that it will not accomplish the ends proposed by its construction.

100. The railroad, on the proposed route, is, happily, so far separated from the Erie canal, as to be beyond the reach of its influence on its prosperity, as it will benefit distant districts and populations.

101. A railroad in the vicinity of the Erie canal will not accommodate the country on the route I examined. It would also, by ending at lake Erie, be embarrassed by ice in the spring and fall. Freights would also be taxed with insurance against storms and casualties in the lake navigation, and troubled with transhipments, and uncertainty in arrivals and departures. The road would also present, at certain periods of the year, a broken line of communication, and would entail an increased distance in the travel between the east and the west, of more than one hundred and eighty miles.*

102. The above remarks are dictated in a spirit of sincerity, and from a conviction that the district traversed by the Erie canal does not require, at this day, any further improvement but lateral communications with that work, to promote its prosperity and business. If this opinion be erroneous, I shall be happy to retract it, as I am ardently in favor of *all* improvements which the wants or the exigencies of the country may require.

103. The useful effects which are produced by a judicious system of internal improvements, are too clearly illustrated by the benefits they have conferred on the State of New York, to require many remarks. In 1817, when the Erie canal was commenced, there was not more than fifty small villages within a distance of twenty miles on each side, and extending the whole length of the route. There are now more than one hundred and thirty, all exhibiting evidence of prosperity and wealth; well cultivated, and stocked farms, with ornamental and commodious buildings, are found in every direction, and the fruitfulness of the soil may be judged by the revenue of more than one million of dollars which it has yielded to the canal fund within the last year.

104. The plan of construction is a subject which can only be determined after the location of the road. I should, however, propose that it should be a double track, and that locomotive engines should be used entirely on it, to supercede the necessity of the horse path. The rails should also be elevated on suitable blocks, some inches above the ground, to admit of their being freed, in the easiest manner, from the snow and sleets which would lodge on them during winter. The great error of the roads in ope-

* If it should end or pass through Buffalo, New York.

ation, or building, in this country, is, having the rails nearly on the level of the horse path. I would also propose, in deep cuts, that the roads should have an uniform declivity, to admit of the water which may collect to be drained in the easiest manner; and, on heavy embankments, that the road should be constructed of wood, and that suitable turn outs should be made from one track to the other.

105. To many persons it may appear strange how the road can be arranged so as to prevent the locomotive engines, going at different velocities, interfering with each other. This is simply an arrangement of time in starting; for the velocity of the engines being known, and the hour it started, it could easily be arranged that the engines and their trains would meet at certain points, and pass each other.

106. The cost of the road must be a matter of uncertainty until a full examination of the route is made. I am, however, impressed with an opinion, that it will not exceed, on an average, 15 or 17 thousand dollars per mile. If we assume the greatest sum, the cost would amount to 9,282,000 dollars. This is a large investment, but small in comparison to the great ends to be secured.

107. I cannot conclude my report without offering my best wishes for the final success of the proposed work, as it contains the elements of national, State, and individual prosperity.

DE WITT CLINTON,
U. S. Civil Engineer.

